Allocation Methodology Summary

Lachlan Regulated River

Introduction

This is a summary guide to the water allocation method for the Lachlan regulated river. It is a concise document aiming to provide public information on the priorities for water sharing and how water is allocated to competing interests.

The Department of Planning and Environment periodically allocates water to water access licence (WAL) holders after assessing available water resources. The resource assessment identifies the volumes of water available to the different categories of water access licences. The process is known as an Available Water Determination (AWD)[1]. The results of the resource assessment and allocation process are advised through water allocation statements published on the department's website.

The water allocation statement sets out the percentage of entitlement each category of WAL has been allocated and therefore, the volume of water credited to respective accounts. The water allocation statements are normally published monthly until a full allocation is made to all WAL categories.

This summary guide presents the key components behind the water allocation, followed by an example of a past water allocation and statement.

Water users

There are different categories of water use, including basic rights and environmental, as well as different WAL holders. The principles and hierarchy of allocating available water to the different rights and categories of licences are prescribed in the *Water Management Act 2000* and the Water Sharing Plan for the Lachlan Regulated River Water Source 2016. The Act states[2] that sharing of water from a water source must protect the water source, its dependent ecosystems, and basic landholder rights.

The volumes equivalent to 100% allocation to rights, allowance, and licence categories in megalitres (ML) per water year are listed below[3]:

- Basic landholder rights 1,163 ML
- Domestic and stock WAL 12,502 ML
- Local water utility WAL 15,545 ML
- High security WAL 27,680 ML
- General security WAL 592,801 ML
- Conveyance WAL 17,911 ML
- Environmental water allowance (EWA) 20,000 ML
- Water quality allowance (WQA) 20,000 ML

[1] *Water Management Act (2000)*, section 59
[2] Section 5(3)
[3] Water Sharing Plan, clauses 18-28

Planned environmental water

The Lachlan water sharing plan specifies three categories of environmental water[4].

Translucent releases

Wyangala Dam releases a proportion of the inflows, subject to certain conditions in wet periods. The release is met from the applicable inflow when it happens, hence no explicit reserve volume is needed to be held in the resource assessment to meet this obligation.

Environmental Water Allowances (EWA)

The resource assessment may set aside an annual budget of 20,000 ML, depending on the general security water allocation.

Water Quality Allowance (WQA)

The allowance may rise to 20,000 ML each water year to address water quality issues. However, no more than 10,000 ML has been needed historically. While, the opening allocation sets aside 20,000 ML, the volume is typically budgeted for two years.

Opening allocations

New allocations are made at the beginning of each water year (1 July) for the following users; domestic and stock, local water utility, high security, conveyance, EWA and WQA, as their account balance for the outgoing year cannot be carried forward and is forfeited[5].

Accordingly, the following allocations are directed by the water sharing plan for these users on 1 July each water year whenever possible:

- Full 20,000 ML for WQA[6].
- Full (100%) allocation for domestic & stock, local water utilities, and high security licences[7].
- Wyangala EWA and Brewster EWA each 10 gigalitres (GL) if the general security account balance > 50% of general security entitlement.[8]
- An allocation for Conveyance WAL is based on the Jemalong general security account balance. [9]

If a year starts with insufficient water to meet the opening allocation levels, then they are met with the next available (system inflows) water[10]. If the general security balance is insufficient to enable EWA credit at the beginning of the year, then the 20 GL credit is deferred until the available balance in general security carryover, plus cumulative allocation rises to 75% of entitlement[11].

[4] Water Sharing Plan, clauses 26-28
[5] Water Sharing Plan, clause 27(5), 28(4), 55(1)
[6] Water Sharing Plan, clause 28(2)
[7] Water Sharing Plan, clauses 44 – 46
[8] Water Sharing Plan, clause 27(2)(a)
[9] Water Sharing Plan, clause 48
[10] Water Sharing Plan, clause 44(3), 45(3), 46(3)
[11] Water Sharing Plan, clause 27(2)(b)

Major steps in water allocation

The major steps in the resource assessment process to enable water allocation include:

- Identifying the volume of water currently in storages and in transit.
- Budgeting for a future inflow into dam and from downstream tributaries.
- Deducting all existing commitments, inclusive of future higher priority commitments.
- Setting aside water for system overheads to deliver allocated water.

This can be further illustrated using Equation (1) below.

$$Water\ for\ Allocation = Available\ Resource + Future\ Inflow - Commitments - System\ Overheads \quad (1)$$

Water available for allocation first goes to meet any unmet opening allocations listed earlier. Then available water is allocated to lower priority general security and conveyance accounts until full.

Allocation to conveyance accounts is a function of the general security account balance for the Jemalong Irrigation general security licence[12]. The Jemalong general security account balance includes water carried over and water allocated in the current water year.

Allocations to conveyance licences will therefore, incrementally increase with general security allocations. In accordance with the water sharing plan, conveyance allocations will reach 100% allocation when the Jemalong general security account balance reaches 75%. Any water remaining in the conveyance accounts at the end of the water year is forfeited.

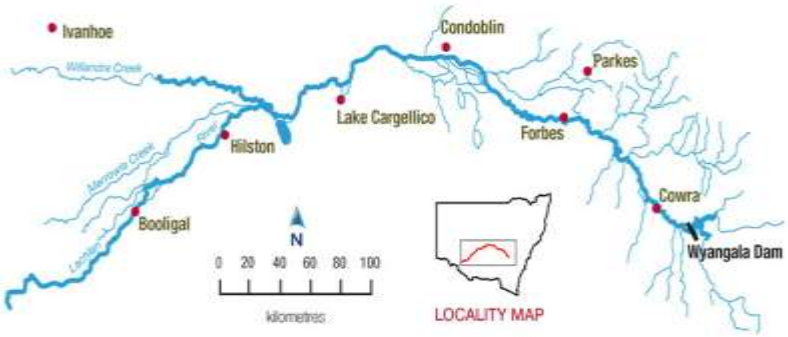


Figure 1 - Lachlan regulated river system

Every river system has its own way of arranging the line items of its balance sheet (see Table). In broad terms, the balance sheet conforms with Equation (1), as explained next.

Available resource

The Lachlan Regulated River Water Source has three main storages (Figure 1). Wyangala Dam is the headwater storage, with a capacity of 1,217 GL and is the major storage for water supply along the Lachlan River. Lake Brewster and Lake Cargelligo are large lakes that have been modified for use as off-river storages. They fill naturally from the Lachlan River in times of high flows and are also of high ecological value.

Carcoar Dam water is shared among users of the Belubula Regulated River Water Source only and this regulated system is not available to users on Lachlan River. However, water leaving the Belubula system comprises unregulated tributary inflow for the Lachlan River as discussed below.

[12] Water Sharing Plan, clause 48

Water in transit

Water in the river arising from tributary inflows or releases from Wyangala Dam may also be considered a usable resource if it can be stored in Lake Brewster or Lake Cargelligo, or used to meet consumptive or environmental demands. This may potentially include flood mitigation release from Wyangala if that water can be captured (re-regulated) in the lakes.

Small volumes of water associated with other weirs and pondages normally have little bearing on overall resource availability and tend to be excluded from the resource assessment.

Future inflow

The key principle in the resource assessment is that enough water must be available to meet high priority needs through a repeat of the driest observed inflow period prior to the commencement of the first water sharing plan on 1 July 2004. This is a statutory obligation that has been outlined in the water sharing plan[13] and balances the risk between allocating water for productive use and water security in the event of a drought.

The resource assessment planning horizon varies from 30 months to 19 months, always ending at the end of May, after which, historically, drought-breaking inflows should eventuate.

The longest horizon starts from December, spanning to 30 months; the second longest starts on January, spanning to 29 months; and so on. The horizon wanes until the next November, some 19 months, after which planning steps out again to 30 months. It resembles a caterpillar action. The budgeted minimum inflow (and the corresponding demand) reduces as the planning horizon shortens.

Three sets of minimum inflows are considered in the resource assessment:

- Inflows into Wyangala Dam
- Inflows from Goobang Creek (412043)
- Inflows from the Belubula River (412033), Boorowa River (412029) and Mandagery Creek (412030).

The respective inflows are listed in Table 1 below.

Table 1. Minimum inflow volume – period assessed 1898 to 2003

Planning horizon	Number of Months	Wyangala Dam Inflow (GL)	Goobang Creek	Belubula River, Boorowa River and Mandagery Creek	Historical period*
Dec to May to May to May	30	189.2	13.5	103.4	Dec 1978 – May 1981
Jan to May to May to May	29	156.6	12.5	95.7	Jan 1979 – May 1981

[13] Water Sharing Plan, Clause 29

Planning horizon	Number of Months	Wyangala Dam Inflow (GL)	Goobang Creek	Belubula River, Boorowa River and Mandagery Creek	Historical period*
Feb to May to May to May	28	157.4	11.9	93.3	Feb 1979 – May 1981
Mar to May to May to May	27	157.2	11.5	92.3	Mar 1979 – May 1981
Apr to May to May to May	26	153.6	11.1	89.2	Apr 1979 – May 1981
May to May to May	25	150.7	10.9	86.2	May 1979 – May 1981
Jun to May to May	24	144.7	10.7	82.1	Jun 1979 – May 1981
Jul to May to May	23	137.4	6.5	79.2	Jul 1979 – May 1981
Aug to May to May	22	132.0	4.4	76.1	Aug 1979 – May 1981
Sep to May to May	21	93.2	4.0	36.4	Sep 1918 –May 1920
Oct to May to May	20	62.0	3.1	26.6	Oct 1918 – May 1920
Nov to May to May	19	49.9	2.2	22.9	Nov 1918 – May 1920

*Applicable to inflow into Wyangala Dam

Commitments

Each monthly assessment accounts for commitments for the current water year and the future years covered in the planning horizon discussed above. Current year commitments include water for basic landholder rights and the account balances of the water that has been already allocated.

Future year commitments include basic landholder rights and the required annual opening allocations discussed earlier. Between December and June, when the planning horizon starts at 30 months in December and reduces to 24 months in June, the remainder of the current water year and the next 2 years of commitments are reserved in the resource assessment.

Between July and November, when the planning horizon is 24 months to 19 months, the remainder of this water year and the next water year's commitments are reserved in the resource assessment.

System overheads

System overheads are volumes that are required to operate the river. Delivery of water through natural river systems experiences loss through seepage into the riverbed and banks. The transmission loss is dependent on soil moisture and climatic conditions.

Furthermore, water delivery efficiency is subject to uncertainties, such as, forecast tributary flows, flow routing volumes, positive bias in favour of meeting demands, rejection of ordered when due to rain and necessary flow rates to keep river continuity. These unavoidable losses are classed under system overheads in this document. The key components in the system overhead are explained below.

Evaporation loss

Evaporation loss is a direct function of storage levels, the time of the year and the drawdown pattern over the planning horizon. The forecast loss is an estimate and is based on the evaporation from the surface area of the three storages over the planning horizon.

Over the planning horizon period, the storages are drawn down from their current level using a given release pattern and monthly evaporation heights. Evaporation heights (net of rainfall) are reflective of monthly rainfall and pan evaporation data at Cowra (Soil Conservation Service) for Wyangala Dam and Condobolin for Lakes Brewster and Cargelligo.

The resource assessment budgets for an annual net evaporation of 997 mm from Wyangala Dam and 1533 mm from the lakes. With storages depleting from near full, this amounts to approximately 210 GL to 162 GL when the planning horizon is at 30 to 19 months respectively (as budgeted in the 2021 resource assessment).

Lake Cargelligo and Lake Brewster are modified wetlands and are relatively shallow, so the evaporative loss is comparatively much higher than that from Wyangala Dam.

Unallocated volume

The volume of water that stays below the outlet and cannot be released by gravity is known as dead storage. A dead storage of 16 GL remains unallocated as inaccessible storage in the resource assessment, but theoretically could be pumped for critical needs.

Lachlan general security allocation is usually rounded down to the nearest 1%. The unallocated fraction is reported within this line item as well.

Fixed overheads

The system overheads to deliver water and meeting flow targets are divided into a fixed overhead and a variable loss. Fixed overhead accounts for small demands that are relatively stable annually, such as delivery to rights (about 4 GL) to small domestic and stock users, to towns, replenishment flows[14] (up to 42.5 GL) and the maintenance of a visible end-of-system flow at Geramy[15] (operator's estimate is about 13 GL).

The resource assessment budgets a fixed 180 GL to cover these items. This is derived along with the variable loss using a linear regression explained below.

Variable loss (transmission loss)

The demands from high security, general security, EWA and WQA water users vary from year to year. Losses consumed in meeting these demands display a general linear trend. Analysis of deliveries from 1994-95 to 2018-19 returned this linear relationship, with the intercept representing the fixed overhead and the slope representing the variable loss.

Release overhead in GL = 180 GL + 14% x WAL Order in GL

Accordingly, the resource assessment sets aside a variable loss of 14% to deliver water to high security and general security users in the system. The estimate closely matches the recent deliveries during 2015-16, 2017-18 and 2018-19.

[14] Water Sharing Plan, clause 30
[15] Water Sharing Plan, clause 31

Conveyance

The conveyance WAL covers the loss incurred within the internal delivery system of Jemalong Irrigation. Conveyance allocation and general security allocation to Jemalong Irrigation are delivered from the Lachlan River and debited from accounts accordingly. No additional loss budget to deliver to individual users inside the district is required.

Water allocation example of 8 September 2021

The table below shows the water allocation computation behind the statement that was published on 8 September 2021. The resource assessment returned a 1% increase in allocation to general security entitlement holders.

Table 2. Lachlan Resource assessment of 8/9/2021

Assessment Items (9/21 to 5/23)	GL	GL
Resources		1477
Wyangala Dam (31/8/2021)	1191	
Lake Cargelligo (31/8/2021)	42	
Lake Brewster (31/8/2021)	81	
Minimum inflows (9/21 to 5/23)	133	
Water in transit (1/9/21 to 30/9/21)	30	
Less commitments		(865)
Planned environmental water (EWA=25GL, WQA=20GL)	45	
Stock and domestic (9/21 to 6/22, 2022/23)	25	
Local water utility (9/21 to 6/22, 2022/23)	31	
High security (9/21 to 6/22, 2022/23)	97	
Conveyance (9/21 to 6/22, 2022/23)	36	
General security balance (31/8/21)	631	
Less overheads		(606)
Evaporation (9/21 to 5/23)	159	
Fixed overhead, transmission loss (9/21 to 5/23)	428	
Unallocated volume	19	
Surplus for allocation (or shortfall)		6

General security allocation = Surplus / Eligible GS shares = 6 GL / 592.8 GL = 1% extra allocation.

(The 6 GL is therefore added to the 631 GL in accounts to total 637 GL of GS allocation).

The water allocation statement (Annexure) identifies that general security allocation at this point of the year is 48% of entitlement and average carryover 71%, totalling 119% overall general security water availability.

Note: at this time, September, the water in accounts (637 GL) is less than water allocated, due to usage.

The additional transmission loss to deliver 1% increment = 0 (included in the 428 GL above).

Additional conveyance allocation = 0 (had reached its maximum).

Disclaimer

Allocations are based on a very conservative future inflow budget. However, during extended dry period, inflow may be less than the budget with higher delivery losses creating shortfalls in allocated resources. The management of a system deficit during extreme drought is beyond the scope of this summary guide. Readers are referred to the NSW Extreme Events Policy for details.

The routine water allocation computation, while follows this guideline, is subject to wider hydrological considerations not covered in this summary document. This is a guide only and subject to improvements and changes over time. Water users should use this information with caution and are encouraged to seek their own expert advice as needed.

Version history

First edition	May 2020	N Maini
This edition	March 2022	C Barclay, S Chowdhury

Annexure

Example: Water allocation statement - 8 September 2021

Water Allocation Statement

Water availability and allocation update

8 September 2021

Lachlan Regulated River Water Source

Water allocation update

Allocations to **general security (GS) entitlements have increased by 1%** in the Lachlan regulated river water source, bringing the total cumulative allocation to 48% for this water year. All other entitlements, including conveyance, are fully allocated. With average GS carryover equivalent to 71% of entitlement, the total available water to GS users totals approximately 119% of entitlement.

The catchment is wet. Throughout August, system inflows totalled around 500 gigalitres (GL). Water is being released from Wyangala Dam to create airspace and reduce downstream flood risks, but the storage will be filled when irrigation demand commences. The releases from Wyangala Dam and tributary inflows are continuing to be used to meet translucent flow obligations with the balance being captured downstream including in Lake Brewster.

It is likely that all major storages in the Lachlan catchment will fill in September. When all storages are full and airspace releases continue to be required, a spill and reset of GS accounts and conveyance accounts, and a spill of high security spillable sub-accounts, will occur in accordance with the water sharing plan, where these accounts are emptied and credited with a new allocation.

Translucent flows have been triggered in the Lachlan since the end of July. Translucent flows are to deliver environmental outcomes by providing some mimicking of natural flow variability. Floodplains and creeks that have benefited include Moon Moon Swamp, Booligal wetlands, the Great Cumbung Swamp, and the effluent creeks in the Lower Lachlan. The annual translucent flow limit of 350 GL is approaching, with about 344 GL expected to be delivered by mid-September.

The Annual Use Limit that applies to water users in this 2021/22 water year is a volume equivalent to 100% of entitlement. This is the maximum amount that can be used in the 2021/22 water year, plus any up or down adjustments for trade. Note that in the event of a system spill and an account reset, the annual use limit is not reset.

2021/22	High Security	General Security
Lachlan Regulated River Water Source	100%	48%

Storage levels (as at 7 September 2021)

- Wyangala Dam is 96% full – rising – holding around 1,167,000 ML
- Lake Cargelligo is 112% full – rising – holding around 40,000 ML
- Lake Brewster is 64% full – rising – holding about 94,000 ML.

Wyangala Dam Airspace Operations and Spills

The strategy to manage airspace in Wyangala Dam has been developed in line with rules in the water sharing plan. It aims to provide a good chance (at least 80%) of Wyangala Dam, Lake Brewster and Lake Cargelligo being full when irrigation demand begins in October. Pre-releases from Wyangala Dam will continue and will be stored in Lake Brewster whenever possible. These releases are being actively managed in consultation with the Lachlan Airspace Panel to avoid exceeding the minor flood level at Forbes, Cottons Weir or Jemalong Weir and to minimise impacts on communities.

Updates on the flood and airspace operations can be found on the Water Insights portal (https://waterinsights.waternsw.com.au/11983-lachlan-regulated-river/updates). Information on flood updates and advice can also be found at the NSW SES website (https://www.ses.nsw.gov.au/).

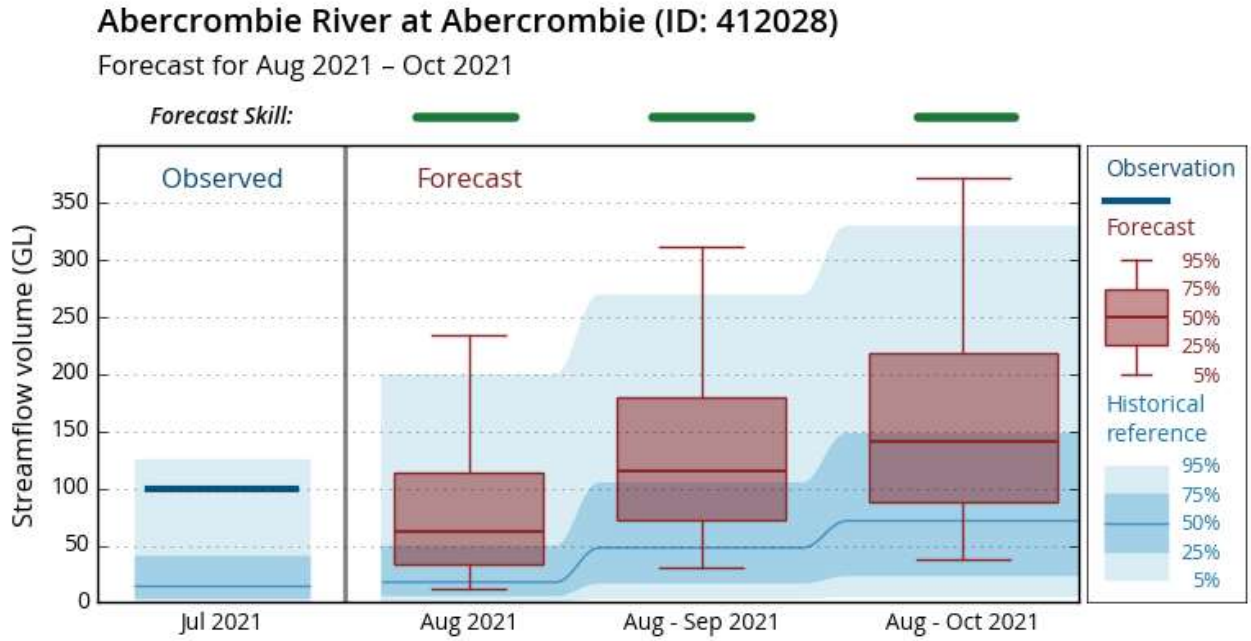
Water users are advised to note the following:

- All valid orders made in good faith prior to any account reset date will be honoured in full according to the accounting arrangements at the time the order was made, taking into consideration travel times to extraction points.
- If there is an account spill and reset, there will be no further reset in the following 6 months.
- An account reset will rarely deliver the maximum 136% allocation because it depends on the time of year of the reset and the future inflow sequence. An account reset in September is unlikely to produce allocations higher than the current average GS water availability 119% of entitlement.
- The allocation from a reset will be based on the usual resource assessment at the time.

Seasonal climate and streamflow outlooks

The Bureau of Meteorology's seasonal outlook for September to November indicates that rainfall is likely to be above average across the catchment. Daytime temperatures are likely to be cooler than average and overnight temperatures are likely to be warmer than average. A negative Indian Ocean Dipole event is underway and is expected to persist until at least mid-spring. This increases the chance of above average spring rainfall in the catchment.

The Bureau of Meteorology also issues a seasonal flow forecast for the Abercrombie River that drains into Wyangala Dam (see the figure below). This provides a forecast of potential storage inflows. Four out of five forecast flow references are much higher than the historical references for August to October, indicating the likelihood of higher than historical flows throughout these months.



For further details: http://www.bom.gov.au/water/ssf/?ref=ftr#id=412028

Lachlan Resource Assessment Data Sheet

Resource Distribution (September 2021 to May 2023)	Volume (GL)
Current and Future Resources [1]	1,477
less	
General Security account balance [6][7]	637
Conveyance	36
Planned Environmental Water [2]	45
High Security [3] [6]	97
Towns, Stock, Domestic [3]	56
Evaporation from storage [4]	159
Essential Requirements and Losses [5]	428
Inaccessible storage	19
equals	
Surplus (or deficit)[8]	0

Notes:

(1) End of August 2021 storage volume in Wyangala Dam, Lake Cargelligo, and Lake Brewster, and the expected minimum inflows from September 2021 to May 2023.

(2) Water allocated to the Water Quality Allowance and/or the Environmental Water Allowances (EWA). The volume represents the balance of the allocated volumes to WQA and EWAs. The Wyangala and Brewster EWAs have been allocated 10 GL each for the 2021/22 water year, with 5 GL of the Brewster EWA already been used. Another, 10 GL has also been allowed for the Wyangala EWA for next water year. In addition,10 GL each year is allocated to the WQA. 'Licence-based' environmental water is excluded from this category.

(3) Towns, Stock, Domestic and High Security: reserves are set aside to meet full allocation of these licences to 2022/23. Balances in high security accounts also include water traded in from general security licences, if any.

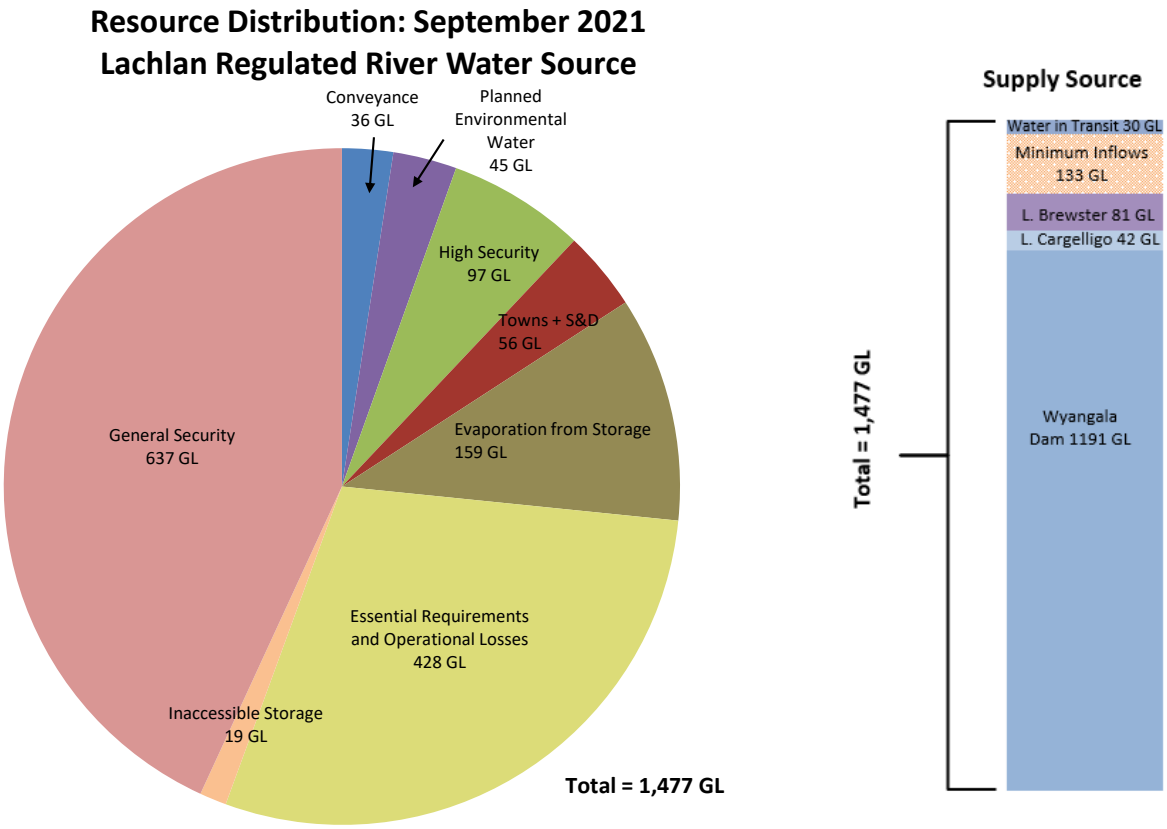
(4) The evaporation volumes from all three storages are based on the forecast storage levels over the assessment period.

(5) Essential requirements include basic rights and any replenishment deliveries required. The loss budget (transmission and operational) is based on the best estimate of the volume required to run the river under dry conditions through to May 2023. This mostly consists of natural transmission losses as water soaks into riverbed sands. The loss allowance is updated regularly.

(6) This may include held environmental water (HEW) as shown in the pie chart. The reporting of HEW is indicative only, prior to reconciliation of usage and net trade, and is estimated 83 GL of GS, and 37 GL of HS. These reported entitlements are managed by agencies holding environmental water accounts. They include the NSW DPIE - Environment, Energy and Science (EES) and the Commonwealth Environmental Water Holder (CEWH).

(7) The GS account balance includes AWDs made this water year plus GS water carried over from the previous year.

(8) All available water resources have been fully allocated. The system is secure to May 2023 and beyond.



Next announcements

The next routine water allocation announcement for the Lachlan Regulated River Water Source will be issued on **Monday 11 October 2021** or earlier if the resource situation changes significantly.

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